9620
DUAL DIFFERENTIAL LINE RECEIVER
FAIRCHILD INTEGRATED CIRCUIT

GENERAL DESCRIPTION — The 9620 is a dual differential line receiver designed to receive differential digital data from transmission lines and operate over the military and industrial temperature ranges. It can receive ±500 mV of differential data in the presence of high level (±15 V) common mode voltages and deliver undisturbed CCSL logic to the output. In addition to line reception the 9620 can perform many functions, a few of which are presented in the applications section. It can interface with nearly all input logic levels including CML, CTμL, HLLDTμL, RTμL and CCSL. HLLDTμL logic can be provided by tieing the output to V_{CC2}(+12 V) through a resistor. The outputs can also be wire OR'ed. The 9620 offers the advantages of logic compatible voltages (+5 V, +12 V), CCSL output characteristics, and a flexible input array with a high common mode range. The direct inputs are provided in addition to the attenuated inputs (normally used) to allow the input attenuation and response time to be changed by use of external components.

FEATURES:

- **CCSL COMPATIBLE OUTPUT**
- **HIGH COMMON MODE VOLTAGE RANGE**
- **WIRED-OR CAPABILITY**
- **DIRECT INPUTS (A_D, B_D)**
- **FULL MILITARY TEMPERATURE RANGE**
- **LOGIC COMPATIBLE SUPPLY VOLTAGES**

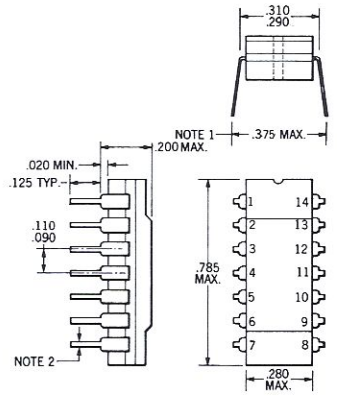
ABSOLUTE MAXIMUM RATINGS (above which the useful life may be impaired)

Storage Temperature	−65°C to +150°C
Temperature (Ambient) Under Bias	−55°C to +125°C
V_{CC1} Pin Potential to Ground Pin	−0.5 V to +7.0 V
Input Voltage Referred to Ground (Attenuator Inputs)	±20 V
Voltage Applied to Outputs for High Output State	−0.5 V to +13.2 V
V_{CC2} Pin Potential to Ground Pin	V_{CC1} to +15 V

ORDER INFORMATION

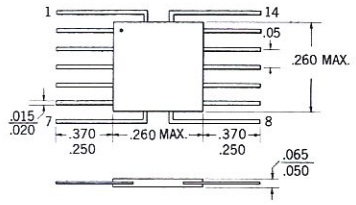
Specify U6A9620XXX for 14 pin Dual In-Line package or U3I9620XXX for 14 pin Flat Package where XXX is 51X for the −55°C to +125°C temperature range, or 59X for the 0°C to +75°C temperature range.

TYPICAL DUAL IN-LINE PACKAGE
In Accordance With
JEDEC (TO-116) Outline

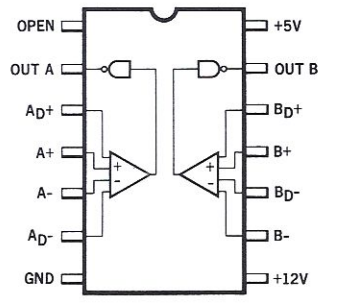


NOTES:
1. Leads are intended for insertion in hole rows on .300" centers. They are purposely shipped with "positive" (.375) misalignment to facilitate insertion.
2. Board-drilling dimensions should equal your practice for a conventional .020 inch diameter lead.

14-PIN FLAT PACKAGE



LOGIC DIAGRAM



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FAIRCHILD SEMICONDUCTOR
A DIVISION OF FAIRCHILD CAMERA AND INSTRUMENT CORPORATION

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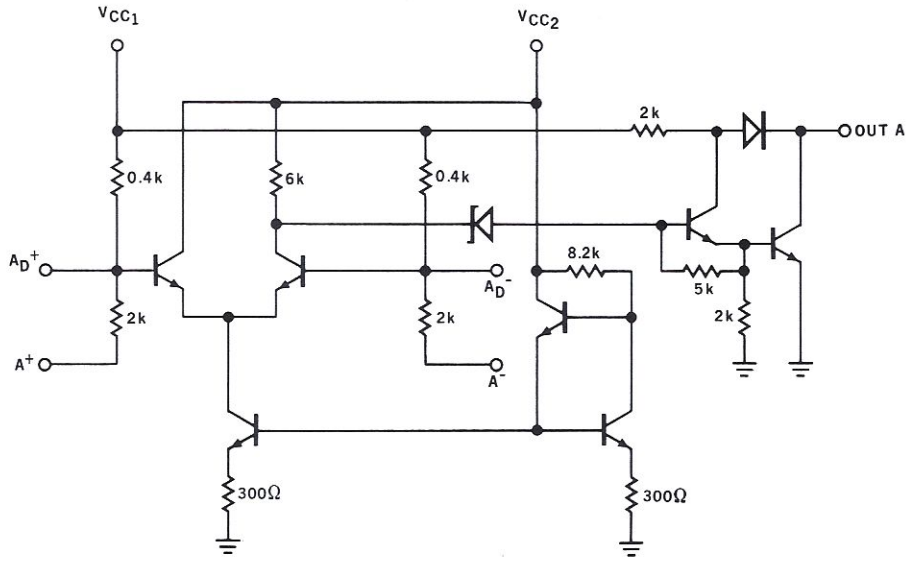
ELECTRICAL CHARACTERISTICS (Temperature Range −55°C to +125°C, $V_{CC1} = 5.0\ V \pm 10\%$, $V_{CC2} = 12.0\ V \pm 10\%$)

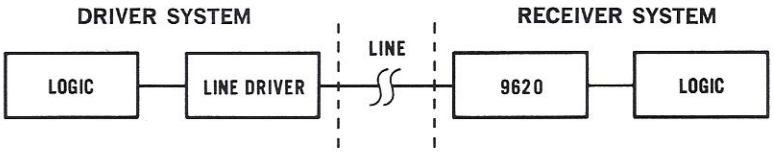
SYMBOL	CHARACTERISTIC	LIMITS −55°C MIN.	−55°C MAX.	+25°C MIN.	+25°C TYP.	+25°C MAX.	+125°C MIN.	+125°C MAX.	UNITS	CONDITIONS & COMMENTS	
V_{OL}	Output Low Voltage		0.40		0.25	0.40		0.45	Volts	$V_{CC1} = 4.5\ V$ $I_{OL} = 15.0\ mA$	$V_{CC2} = 10.8\ V$ $*V_{DIFF} = 0.5\ V$
V_{OH}	Output High Voltage	2.8		3.0	3.3		2.9		Volts	$V_{CC1} = 4.5\ V$ $I_{OH} = -0.2\ mA$	$V_{CC2} = 10.8\ V$ $*V_{DIFF} = -0.5\ V$
I_{CEX}	Output Leakage Current		50			100		200	μA	$V_{CEX} = 13.2\ V$	
I_{SC}	Output Shorted Current			−1.4	−2.15	−3.1			mA	$V_{CC1} = 5.0\ V$	$V_{CC2} = 12.0\ V$
I_F	Input Forward Current		−3.1		−2.1	−3.0		−3.0	mA	$V_{CC1} = 5.0\ V$	$V_{CC2} = 12.0\ V$
$†V_{TH}$	Differential Input Threshold Voltage		500		120	500		500	mV	$V_{CC1} = 5.0\ V$	$V_{CC2} = 12.0\ V$
$†V_{CM}$	Common Mode Voltage	−15	15	−15	±17.5	15	−15	15	Volts	$V_{CC1} = 5.0\ V$ $*V_{DIFF} = 2.0\ V$	$V_{CC2} = 12.0\ V$
I_{VCC1}	5 V Supply Current		13		8.2	13		13	mA	$V_{CC1} = 5.5\ V$ $V_{CC2} = 13.2\ V$	+Input = 5.5 V −Input = 0 V
I_{VCC2}	12 V Supply Current		8.0		5.6	8.0		8.0	mA	$V_{CC1} = 5.5\ V$ $V_{CC2} = 13.2\ V$	+Input = 5.5 V −Input = 0 V
t_{pd+}	Turn-off Time				35	50			ns	$R_L = 3.9\ k\Omega$	$C_L = 30\ pF$
t_{pd-}	Turn-on Time				20	50			ns	$R_L = 390\ \Omega$	$C_L = 30\ pF$

†All input voltages are referred to the attenuated inputs (A^+, A^-, B^+, B^-)
*V_{DIFF} is a differential input voltage referred from A+ to A− and from B+ to B−.

Fig. 1 — SCHEMATIC DIAGRAM



STANDARD USAGE

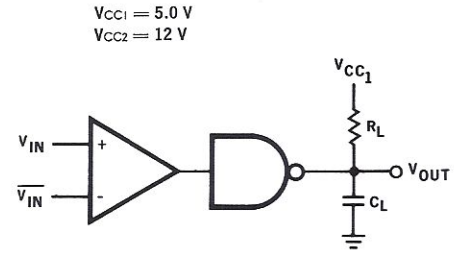


ELECTRICAL CHARACTERISTICS (Temperature Range 0°C to +75°C, $V_{CC1} = 5.0\ V \pm 5\%$, $V_{CC2} = 12.0\ V \pm 5\%$)

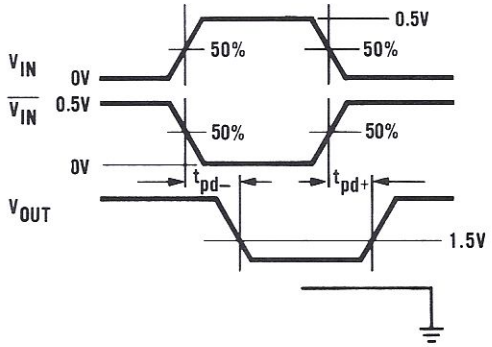
SYMBOL	CHARACTERISTIC	LIMITS 0°C MIN.	0°C MAX.	+25°C MIN.	+25°C TYP.	+25°C MAX.	+75°C MIN.	+75°C MAX.	UNITS	CONDITIONS & COMMENTS	
V_{OL}	Output Low Voltage		0.45		0.25	0.45		0.50	Volts	$V_{CC1} = 4.75\ V$ $I_{OL} = 15.0\ mA$	$V_{CC2} = 11.4\ V$ $^*V_{DIFF} = 0.5\ V$
V_{OH}	Output High Voltage	2.8		3.0	3.3		2.9		Volts	$V_{CC1} = 4.75\ V$ $I_{OH} = -0.2\ mA$	$V_{CC2} = 12.6\ V$ $^*V_{DIFF} = -0.5\ V$
I_{CEX}	Output Leakage Current		50			100		200	μA	$V_{CEX} = 5.25\ V$	
I_{SC}	Output Shorted Current			−1.4	−2.15	−3.1			mA	$V_{CC1} = 5.0\ V$	$V_{CC2} = 12.0\ V$
I_F	Input Forward Current		−3.1		−2.1	−3.0		−3.0	mA	$V_{CC1} = 5.0\ V$	$V_{CC2} = 12.0\ V$
$\dagger V_{TH}$	Differential Input Threshold Voltage		500		120	500		500	mV	$V_{CC1} = 4.75\ V$	$V_{CC2} = 12.6\ V$
$\dagger V_{CM}$	Common Mode Voltage	−12	12	−12	±17.5	12	−12	12	Volts	$V_{CC1} = 5.0\ V$ $^*V_{DIFF} = 2.0\ V$	$V_{CC2} = 12.0\ V$
I_{VCC1}	5 V Supply Current		13.5		8.2	13.5		13.5	mA	$V_{CC1} = 5.25\ V$ $V_{CC2} = 12.6\ V$	+Input = 5.25 V −Input = 0 V
I_{VCC2}	12 V Supply Current		8.5		5.6	8.5		8.5	mA	$V_{CC1} = 5.25\ V$ $V_{CC2} = 12.6\ V$	+Input = 5.25 V −Input = 0 V
t_{pd+}	Turn-off Time				35	75			ns	$R_L = 3.9\ k\Omega$	$C_L = 30\ pF$
t_{pd-}	Turn-on Time				20	75			ns	$R_L = 390\ \Omega$	$C_L = 30\ pF$

†All input voltages are referred to the attenuated inputs (A^+, A^-, B^+, B^-)
*V_{DIFF} is a differential input voltage referred from A+ to A− and from B+ to B−.

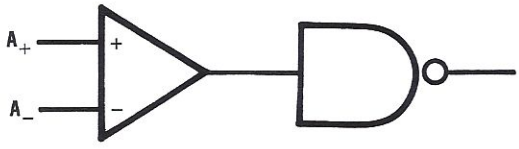
Fig. 2 — SWITCHING TIME TEST CIRCUIT

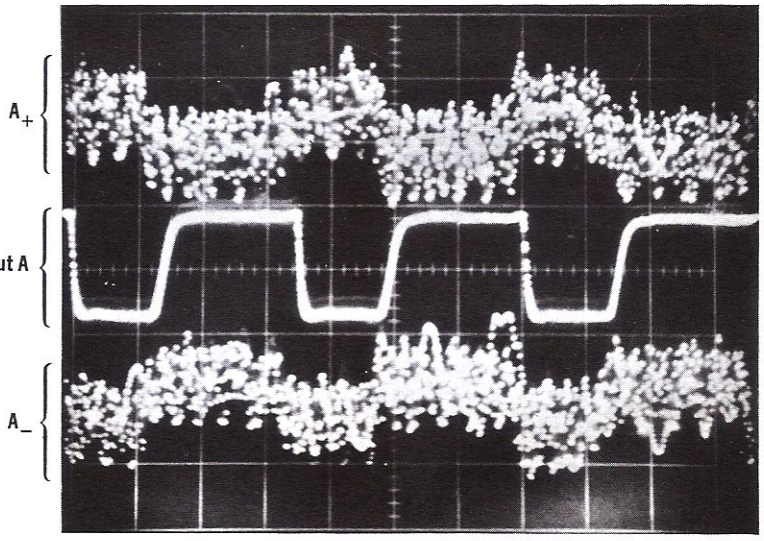


WAVEFORMS



Photograph of a 9620 switching differential data in the presence of high common mode noise.

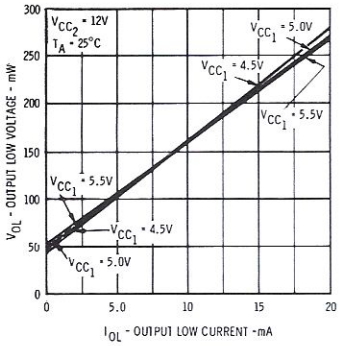




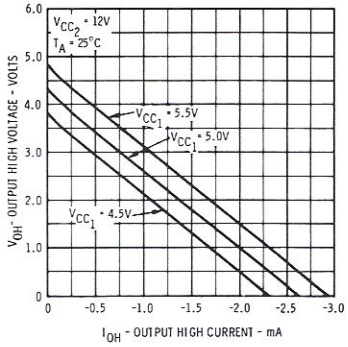
VERT = 2.0 V/div. HORIZ = 50 ns/div.

TYPICAL ELECTRICAL CHARACTERISTICS

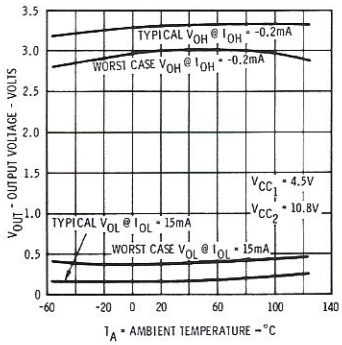
TYPICAL OUTPUT LOW VOLTAGE VERSUS OUTPUT LOW CURRENT



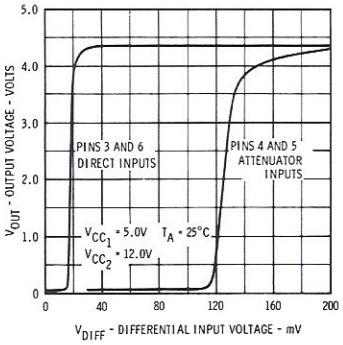
TYPICAL OUTPUT HIGH VOLTAGE VERSUS OUTPUT HIGH CURRENT



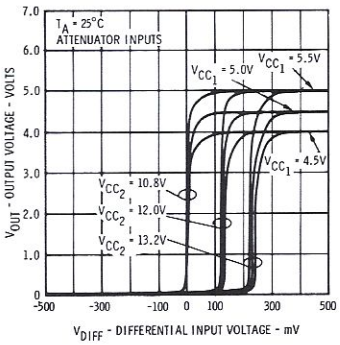
LOGIC LEVELS VERSUS AMBIENT TEMPERATURE


TYPICAL V_{OH} @ I_{OH} = -0.2mA
WORST CASE V_{OH} @ I_{OH} = -0.2mA
V_{CC_1} = 4.5V
V_{CC_2} = 10.8V
TYPICAL V_{OL} @ I_{OL} = 15mA
WORST CASE V_{OL} @ I_{OL} = 15mA
V_{OUT} - OUTPUT VOLTAGE - VOLTS
T_A - AMBIENT TEMPERATURE - °C

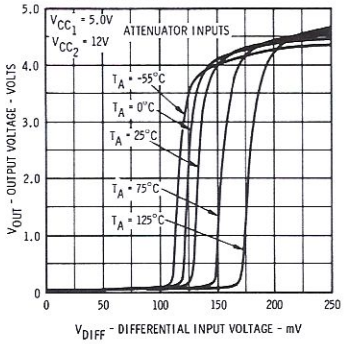
TYPICAL V_{out} VERSUS V_{DIFF} TRANSFER CHARACTERISTIC


PINS 3 AND 6 DIRECT INPUTS
PINS 4 AND 5 ATTENUATOR INPUTS
V_{CC_1} = 5.0V T_A = 25°C
V_{CC_2} = 12.0V
V_{OUT} - OUTPUT VOLTAGE - VOLTS
V_{DIFF} - DIFFERENTIAL INPUT VOLTAGE - mV

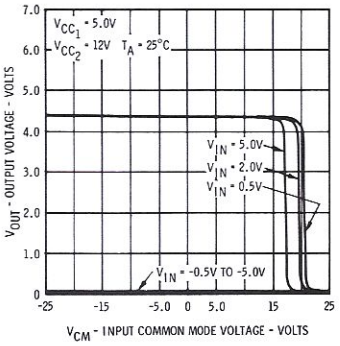
TYPICAL V_{out} VERSUS V_{DIFF} TRANSFER CHARACTERISTIC



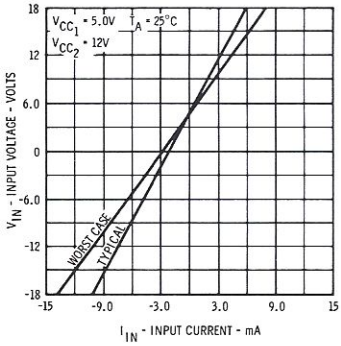
TYPICAL V_{out} VERSUS V_{DIFF} TRANSFER CHARACTERISTIC



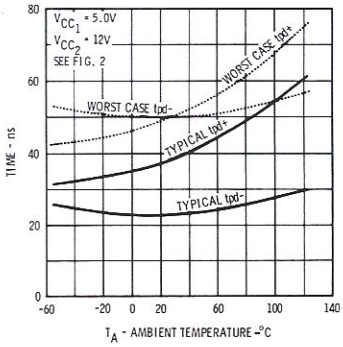
TYPICAL V_{out} VERSUS V_{CM} CHARACTERISTICS


V_{CC_1} = 5.0V
V_{CC_2} = 12V T_A = 25°C
V_{IN} = 5.0V
V_{IN} = 2.0V
V_{IN} = 0.5V
V_{IN} = -0.5V TO -5.0V
V_{OUT} - OUTPUT VOLTAGE - VOLTS
V_{CM} - INPUT COMMON MODE VOLTAGE - VOLTS

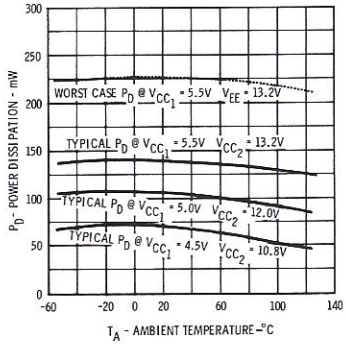
INPUT VOLTAGE VERSUS INPUT CURRENT



SWITCHING TIME VERSUS AMBIENT TEMPERATURE

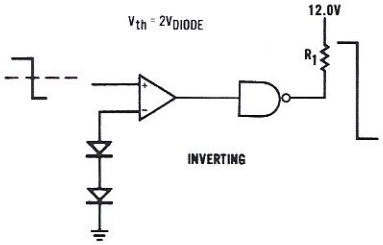


POWER DISSIPATION VERSUS AMBIENT TEMPERATURE


WORST CASE P_D @ V_{CC_1} = 5.5V V_{EE} = 13.2V
TYPICAL P_D @ V_{CC_1} = 5.5V V_{CC_2} = 13.2V
TYPICAL P_D @ V_{CC_1} = 5.0V V_{CC_2} = 12.0V
TYPICAL P_D @ V_{CC_1} = 4.5V V_{CC_2} = 10.8V
P_D - POWER DISSIPATION - mW
T_A - AMBIENT TEMPERATURE - °C

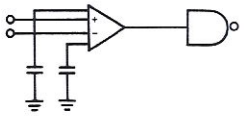
APPLICATIONS

DIGITAL COMPARATOR WITH DIODE REFERENCE AND HIGH LEVEL LOGIC OUT

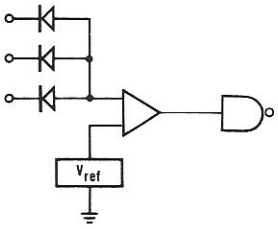


$R_1 \geq 750\ \Omega$

DIGITAL DIFFERENTIAL LINE RECEIVER WITH INPUTS ROLLED OFF

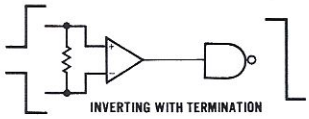


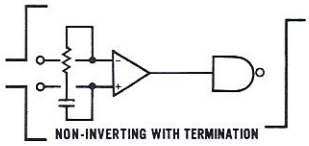
EXPANDED INTERFACE



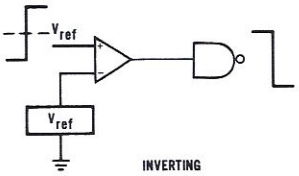
V_{ref} = Resistor, Diodes, or Supply

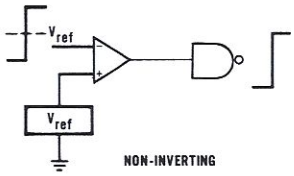
DIGITAL DIFFERENTIAL AMPLIFIER (Line Receiver)



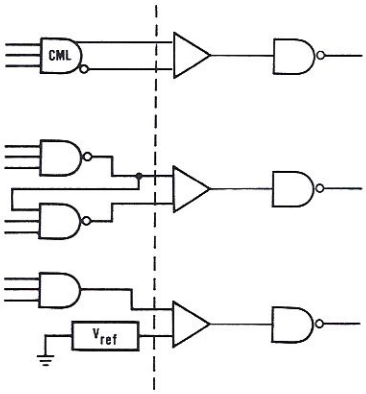


DIGITAL COMPARATOR

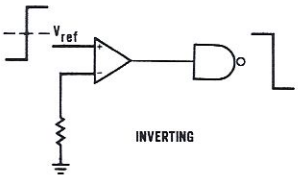


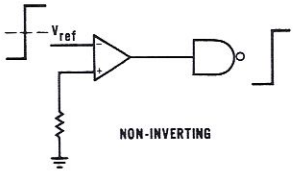


INTERFACING METHODS

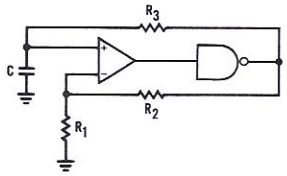


DIGITAL COMPARATOR WITH RESISTIVE DIVIDER AS REFERENCE



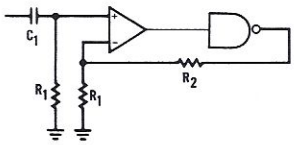


MULTIVIBRATOR



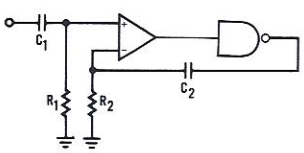
TYPICALLY
$R_1 = 1.6\ k\Omega,\ R_2 = 2.7\ k\Omega,\ T = 1.3\ R_3C$

A.C. COUPLED DIGITAL AMPLIFIER WITH HYSTERESIS



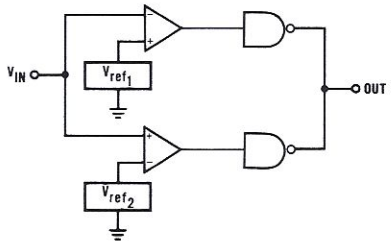
TYPICALLY
$R_1 = 1.6\ k\Omega,\ R_2 = 2.7\ k\Omega$

MONOSTABLE MULTIVIBRATOR NEGATIVE EDGE TRIGGERING



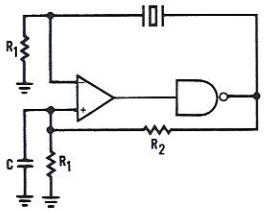
TYPICALLY
$C_1 = 0.1\ \mu F,\ R_1 = 1.2\ k\Omega,\ R_2 = 1.0\ k\Omega$
Pulse Width = 50 ns + $3.15 \times 10^3\ C_2$

DOUBLE-ENDED COMPARATOR



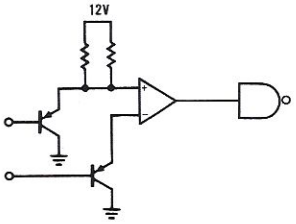
$V_{OH} = V_{Ref1} < V_{IN} < V_{Ref2}$

CRYSTAL CONTROLLED MULTIVIBRATOR



TYPICALLY
$R_1 = 1.6\ k\Omega,\ R_2 = 2.7\ k\Omega,\ C = \frac{R_2}{1000}$

HIGH INPUT IMPEDANCE LINE RECEIVER (Positive Signals Only)



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